PATENT SPECIFICATION

671,572

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COMPLETE SPECIFICATION

Improvements in or relating to Connection Devices for Electric Cables

We, SOCIETE ANONYME DE TELECOMMUNICATIONS, a French Company, of 41 rue Cantagrel, Paris, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention is for improvements in or relating to connectors for flexible overhead electric cables with a star quad.

These cables are employed for the transmission of telephone low or medium frequency currents and must be capable of being frequently assembled and disassembled. To allow this assembling and disassembling, the cable lengths are provided at their ends with special connectors which render it possible to assemble the ends of two cables and are provided with loading coils when the circuits to be connected have to be loaded.

Hitherto, only rubber connectors housed in a rubber sheath have been known for rubber insulated cables.

According to the present invention there is provided a connector for the sealed connection of flexible electric cables having one star quad, with insulation and sheath of thermoplastic material and protected by a steel braid, comprised of two identical parts attached respectively to the ends of two cables to be connected, each part comprising essentially a cylindrical box in which the cable is inserted and wherein are arranged a loading coil for loading one of the two pairs of the cable and a plate with four plugs connected to the cable wires and to the said loading coil, and further comprising a guide, a rubber washer and a clamping head placed on the said box, the guide being fixed and holding the rubber washer in position, said clamping head being free to rotate and the whole allowing a sealed connection of the two parts, and wherein the cylindrical box is terminated on the cable side by a base provided with a leading-in tube for ensuring water tightness at the connection to the cable including a tubular clamping piece extended so as to form an anchoring element for the steel braid of the cable, said anchoring element supporting a lead fillet, olive shaped, for absorbing and distributing the traction stress to which the braid is subjected, the leading-in tube assembly being protected by a rubber tube firmly tied at its ends on the cable and the leading-in tube or by self-vulcanising rubber layers.

The connector which forms the subject of the present invention permits a very rapid connection and ensures a perfect water tight joint. The engagement by plugging is easy, the connector is strong, light and of a small bulk.

By way of example, there is described hereinafter and represented in the appended drawings two examples of a connector having a loading coil, for mounting on a cable insulated with polyethylene and having a sheath of polyvinyl chloride. In the drawings :

Figure 1 illustrates an end-on view of a connector constructed in accordance with the present invention,

Figure 2 illustrates a longitudinal sectional view taken on the axis AB of Figure 1,

Figure 3 is a part sectional plan view of Figure 1,

Figure 4 illustrates two connectors connected together,

Figure 5 illustrates a pair of plugs designed to interchange with one another, and

Figure 6 illustrates a longitudinal view of a slightly different embodiment of the present invention.

Referring to the drawings there is illustrated a cable 1 having a connector connected thereto comprising a star quad formed by four wires 5, 6, 7 and 8, not illustrated separately on the drawing, insulated with polyethylene which form respectively two pairs of the star quad, the said quad being covered with an insulating tube 3 and a braid of steel wire 2 ensuring that the cable is mechanically strong enough. The braid 2 is covered with a sheath of polyvinyl chloride. In the above example, the first pair formed

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by wires 5 and 6 of the cable 1 is not loaded and the second pair formed by wires 7 and 8 is loaded. For this purpose, a loading coil 4 is placed at the centre of the connector. In order to minimise the dimensions as much as possible, the wires 5, 6, 7 and 8 are arranged to extend through a central hole of the coil 4. The wires 5, 6 of the first pair are connected directly to the plugs 18 and 16 without being loaded. The wires 7 and 8 of the second pair are loaded, and they are connected to the coil 4 by means of a splice covered with a protecting sleeve not shown in the drawings. The wires 7 and 8 appear again at the output side of the coil 4 at 7_1 and 8_1 where they are connected to their respective plugs 17 and 15.

Thus the four wires 5, 6, 7 and 8 of the cable 1 are connected to the four plugs of the connector, thus ensuring the electrical continuity of the circuits. The four plugs 15, 16, 17 and 18 are held in position by means of an insulating plate 14. The protecting polyethylene tube 3 is shown in cross section and actually extends into the inside of the hole in the coil 4 so as to protect the wires 5, 6, 7 and 8.

The arrangements which will be described hereinafter ensure mechanical strength and water tightness of the connector assembly. The central part of the connector comprises a cylindrical box 11, on the end of which is screwed a base 10 which is ultimately soldered at 29. The loading coil 4 is placed inside the box 11 which is lined inside with insulating sheets, not shown in the drawings, so as to ensure the required breakdown voltage between the coil and the box. A metal tube for accommodating a screw assembly 22 is soldered to the box 11 and an anchoring element 9 having a nut 26, of brass, for securing it to the base 10, is arranged on the cable 1.

Mechanical strength is obtained by means of the following arrangement; a lead-tin olive-shaped mass 13 is moulded over the anchoring element 9, the wires of the braid being securely tied to the right of the mass 13 on the anchoring element 9.

When the braid is subjected to a traction stress its threads enter the lead mass 13, which distributes the stress, a rubber tube 12 being provided so as to give the braid a yielding support.

The box 11 is filled with polyethylene which is injected under pressure through two holes (not shown in the drawing) provided for this purpose. Thus all the elements which are parts of electrical circuits are coated with polyethylene which renders it possible to ensure a very good insulation. As polyethylene offers the drawback that it does not adhere to the metal, the water tightness of the arrangement can be improved by employing as a filling material an adhesive synthetic resin which can be injected under pressure.

The polyvinyl chloride-metal joints not being tight, water tightness of the connector on the cable side is obtained by means of a leading-in tube arrangement hereinafter described.

The end of the anchoring element 9 carrying the nut 26 enters the inside of a tubular extension provided in the base 10 of the box 11. A rubber washer 27 is arranged inside this tube so that when the nut 26 which screws over the tubular extension of the bottom 10 is tightened, the anchoring element 9 presses on the rubber washer 27 and clamps it against the polyethylene tube 3 and thus forms a perfectly tight seal between the box 11 and the tube 3. Finally a rubber tube 30 or layers of self-vulcanising rubber are arranged above the braid and anchored on the polyvinyl chloride sheath of the cable 1, and on the nut 26.

On the plug side of the connector water tightness is effected by a rubber washer 21, as will be explained later. The electrical circuits are thus perfectly protected.

The assembly above described, including the cable 1, the box 11 and its accessories, the loading coil 4, the four plugs 15, 16, 17 and 18 mounted on their plates 14 is placed in a mould. After moulding, the connection device is partly embedded inside a moulded piece 28. The moulding material is identical with that of the cable sheath which is polyvinyl chloride in the example described. The box 11 is provided with circular ribs for increasing adherence between the polyvinyl chloride and the box. The rubber tube 30 protects the steel braid against any penetration of water which might take place for example at the screw assembly 22 between the polyvinyl chloride moulded part 28 and the box 11 or between the moulded piece of polyvinyl chloride and the cable sheath, also of polyvinyl chloride.

The connector thus obtained then receives the parts necessary for its sealed connection with the connector of another cable; these parts are: a metal guide, 19, of aluminium bronze, a grooved rubber washer 21, and a clamping head 20. The guide is attached to the connector proper by means of the screw assembly 22 which also passes through the box 11. The guide keeps the rubber washer 21 pressed against the front face of the connector. The head can then rotate freely about the connector, the fillet 23 keeping it from sliding on the cable.

Figure 6 illustrates a longitudinal view, in cross-section, of another embodiment employing a different method for securing the guide 19 to the box 11. This embodiment includes two screws 31a and 31b screwing into two internally screw threaded cylindrical studs 32a and 32b secured for example by

brazing or welding to the box 11 at 30a and 30b. This method of securing the parts together has the advantage of leaving inside the box a larger clearance for the wires and their connections.

Referring to Figure 4 which illustrates two assembled connectors a junction is obtained between the ends of two cables provided with their respective connectors, by plugging the plugs of the one into the plugs of the other. The rubber washers 21 of the two connectors come in contact whereupon ramps 25 on one head are engaged in hooks 24 on the other and the heads are turned, which has the effect of clamping tightly the two rubber washers against one another and of sealing the connector. With the system described, the plugs are not subjected to any torsional stress when the heads are rotated. They are not subjected, either, to any transverse stress as is the case with other systems.

Each plug, see Figure 5, consists of three flat blades having unequal spacings, arranged in such a way that the right hand plug and the left hand plug are identical, which renders it possible to have all the connectors identical.

They are arranged on the connector so that the plugging may be effected only in one manner, that is in such a manner that the plugs 15, 17 connected to one loading coil of one of the connectors necessarily plug into the plugs 16, 18 of the other connector, the latter plugs being directly connected to the first pair of the corresponding cable. Thus at each junction effected by the connectors the two pairs of the cable are loaded. With the above arrangement it is impossible for the connector to be incorrectly operated providing two loading coils on the same pair, while the other pair includes no loading coil.

The connection obtained with the arrangement described ensures a very secure contact; the shape selected for the plugs permits of easy cleaning, which is not the case with male and female plugs generally employed. The connectors which are the object of the present invention being identical, the cables may be unwound in any direction, which greatly facilitates the laying of the same.

As is well known, cables provided with their connectors before being laid, are wound on cable drums. A protecting cap ensuring the mechanical protection of the plugs and their protection against dampness or humidity when the cables are not connected together, is provided for each connector. Said caps remain attached to the drums when the cables are laid.

It should be understood that the above embodiment is given by way of example and that numerous modifications may be made to it within the scope of the appended claims.

Finally, the various parts may be made of materials different from those indicated in the description.

What we claim is :—

1. A connector for the sealed connection of flexible electric cables having one star quad, with insulation and sheath of thermoplastic material and protected by a steel braid, comprised of two identical parts attached respectively to the ends of two cables to be connected, each part comprising essentially a cylindrical box in which the cable is inserted and wherein are arranged a loading coil for loading one of the two pairs of the cable and a plate with four plugs connected to the cable wires and to the said loading coil, and further comprising a guide, a rubber washer and a clamping head placed on the said box, the guide being fixed and holding the rubber washer in position, said clamping head being free to rotate and the whole allowing a sealed connection of the two parts, and wherein the cylindrical box is terminated on the cable side by a base provided with a leading-in tube for ensuring water tightness at the connection to the cable including a tubular clamping piece extended so as to form an anchoring element for the steel braid of the cable, said anchoring element supporting a lead fillet, olive shaped, for absorbing and distributing the traction stress to which the braid is subjected, the leading-in tube assembly being protected by a rubber tube firmly tied at its ends on the cable and the leading-in tube or by self-vulcanising rubber layers.

2. A connector as claimed in Claim 1, wherein in each part the cylindrical box is provided on the plug side, with a plug plate supporting four identical plugs, each one of which consists of three flat blades with unequal spacings.

3. A connector as claimed in Claim 1, wherein in each part the loading coil, the plate provided with plugs and the wires connected to the plugs are coated with pressure moulded polyethylene or adhesive synthetic resin.

4. A connector as claimed in Claim 1, wherein in each part the assembly consisting of the cable and cylindrical housing is coated by moulding, with a protecting sheath of thermoplastic material.

5. A connector as claimed in Claim 1, wherein the water tight connection of the two cables is ensured by clamping two rubber washers against each other, the said washer being held in position by the guides, the clamping being ensured by an engagement system with a hook sliding on ramps.

6. A connector as claimed in Claim 1, wherein in each part the guide is secured to the housing by two screws adapted to be screwed into two internally screw threaded

studs which are welded to the housing.

7. A connector for the sealed connection of flexible electric cables constructed, arranged and adapted to operate substantially as hereinbefore set forth with reference to the accompanying drawings.

Dated this 22nd day of February, 1950.

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London, E.C.2.

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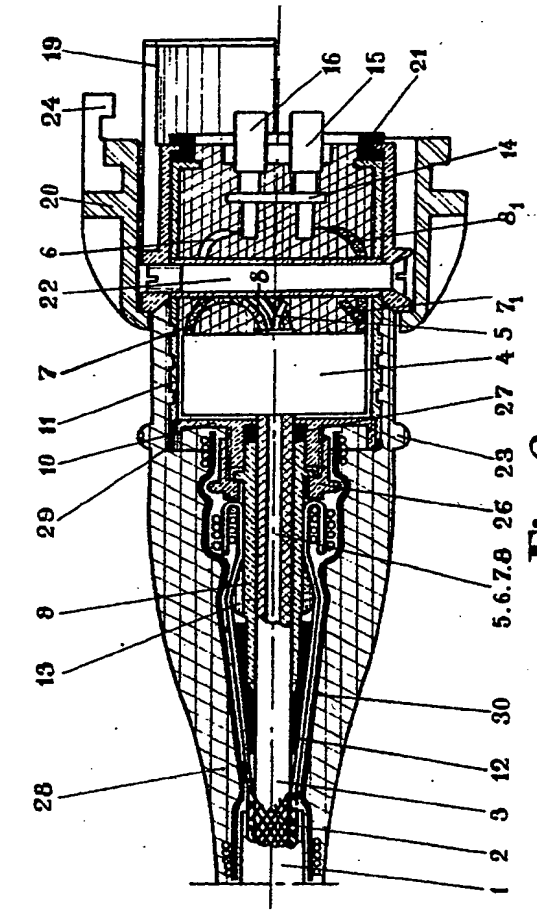

Fig 2

Fig 5

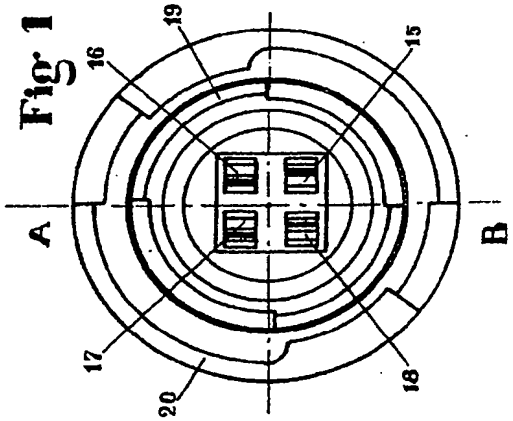

Fig 1

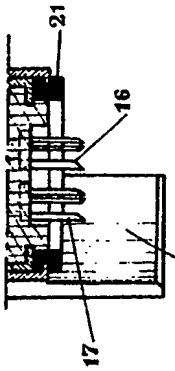

Fig 3

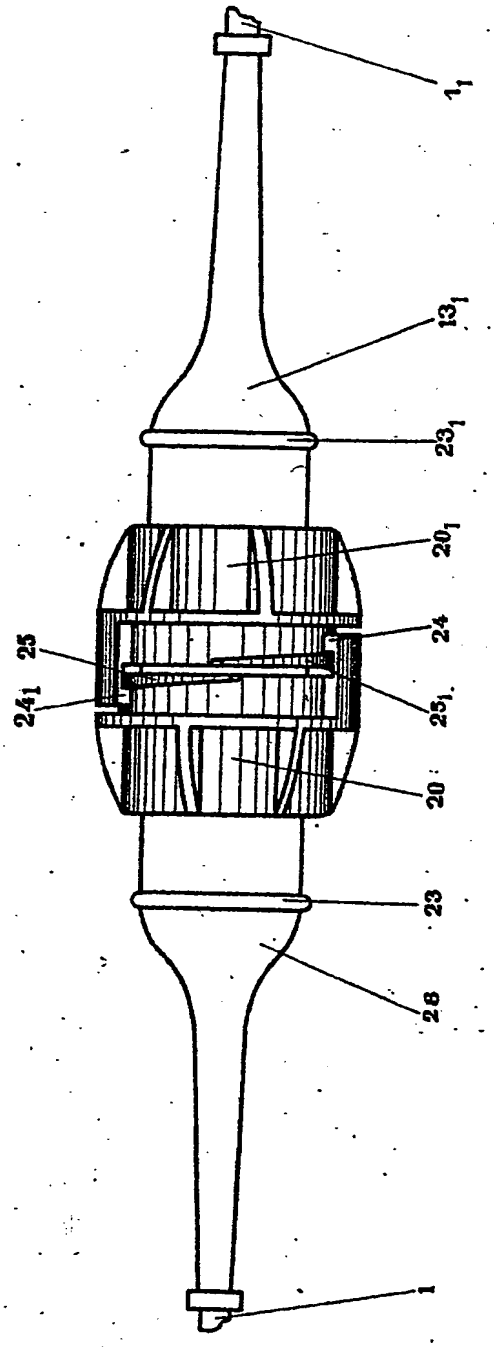

Fig. 4

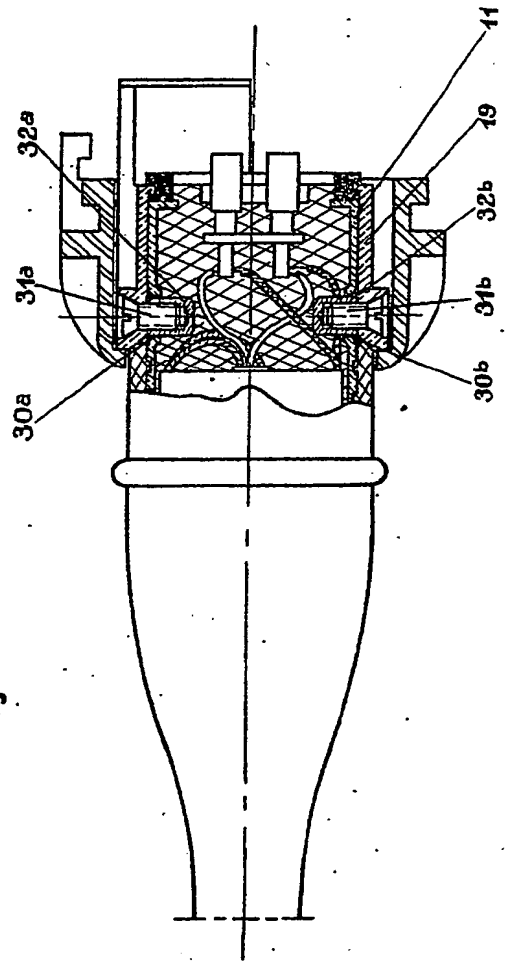

Fig.6

H.M.S.O. (M.F.P.)

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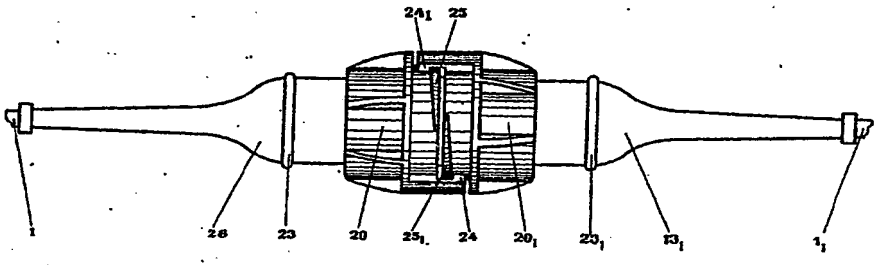
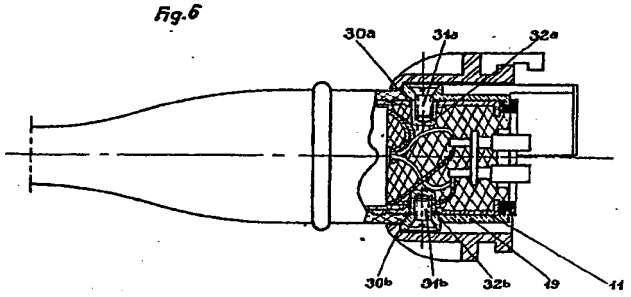


Fig. 4

SHEET 2

Fig.6



H.M.S.O. (M.F.P.)
3 SHEETS
SHEET 3